

Impact of a single session of intermittent pneumatic leg compressions on skeletal muscle and isolated artery gene expression in rats

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Intermittent pneumatic leg compressions (IPC) have proven to be an effective non-invasive approach for treatment of patients with claudication but the mechanisms underlying the clinical benefits remain elusive. In the present study, a rodent model of claudication produced by bilateral ligation of the femoral artery was used to investigate the acute impact of a single session of IPC (150 min) on hemodynamics, skeletal muscle (tibialis anterior) and isolated collateral artery (perforating artery) expression of a subset of genes associated with inflammation and vascular remodeling. In addition, the effect of compression frequency (15 vs. 3 compressions/min) on the expression of these factors was studied.

In ligated animals, IPC evoked an increase of MCP-1 and CXCL1 mRNA ($p < 0.01$) and immunostaining ($p < 0.05$) as well as a minor increase in VEGF immunostaining in the muscle endomysium 150 min post intervention. Further, collateral arteries from these animals showed an increased expression of MCP-1 (~2 fold, $p = 0.02$). These effects were most evident in the group exposed to the high frequency protocol (15 compressions/min). In contrast, IPC in sham-operated control animals evoked a modest initial up-regulation of VEGF ($p = 0.01$), MCP-1 ($p = 0.02$) and CXCL1 ($p = 0.03$) mRNA in the muscle without concomitant changes in protein levels. No changes in gene expression were observed in arteries isolated from sham animals.

In conclusion, IPC acutely up-regulates the expression of important factors involved in vascular remodeling in the compressed muscle and collateral arteries in a model of hindlimb ischemia. These effects appear to be dependent on the compression frequency, such that a high compression frequency (15 compressions/min) evokes more consistent and robust effects compared to the frequency commonly employed clinically to treat patients with claudication (3 compressions/min).

Key words: intermittent pneumatic compression, claudication